MDen
J

James, William Warwick

Some notes on the dates of eruption in 4,850 children, aged under 12.

489768

Digitized by the Internet Archive
in 2011 with funding from
University of Toronto

http://www.archive.org/details/somenotesondates00jame

M Den
J

Some Notes on the Dates of Eruption in 4,850 Children, aged under 12

By

William Warwick
W. W. James, F.R.C.S., L.D.S., and
III
A. T. Pitts, M.R.C.S., L.D.S.

489768
13. 4. 49

Extracted From

Royal Society of Medicine Proceedings. (March 1912.)

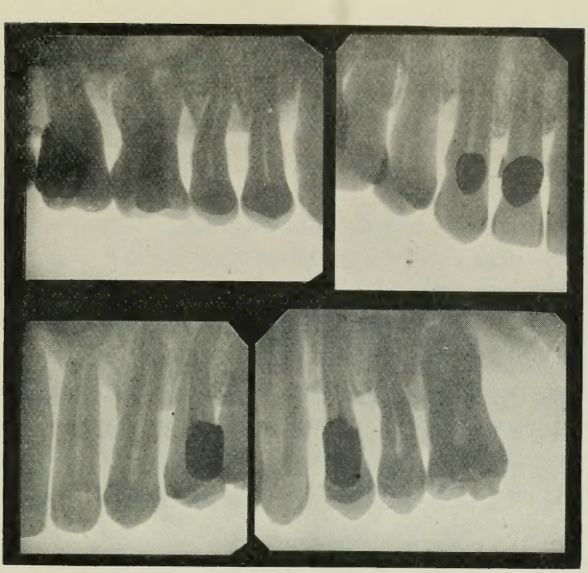


FIG. 2.

Radiographs of the maxillary premolars and molars.

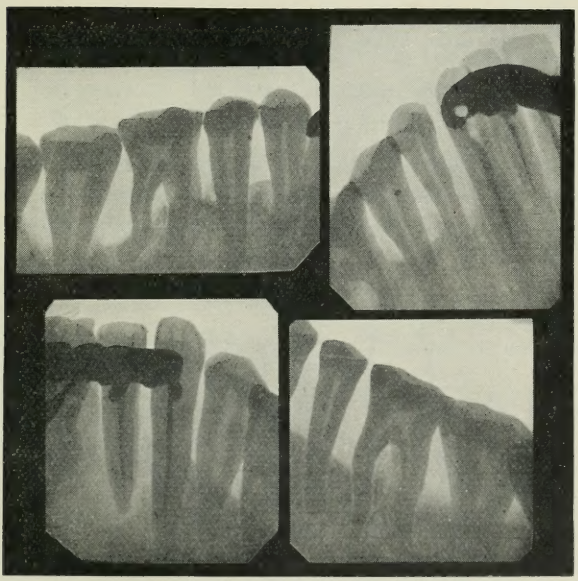


FIG. 3.

Radiographs of the mandibular premolars and molars.

Some Notes on the Dates of Eruption in 4,850 Children, aged under 12.

By W. W. James, F.R.C.S., L.D.S., and A. T. Pitts, M.R.C.S., L.D.S.

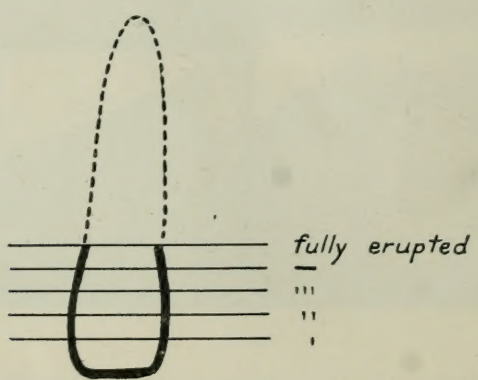
Our investigation into the dates of eruption of teeth has been conducted at the Hospital for Sick Children, Great Ormond Street, upon all the children who have attended the Dental Department during a period of about five years. The age-limit of children attending the Hospital did not permit us to extend our investigation beyond the age of 12, when attendance automatically ceases. Nearly 7,000 new patients were examined, of whom 4,850 showed permanent teeth present or erupting, and upon which our data are based.

Method of Recording.—The method of examination was rendered constant as far as possible by one of us always making the examination of the teeth while the other recorded the results. The condition of eruption of each tooth was noted in five stages which is best illustrated by the following example:—

No. 6400. Male, aged 9 years and 4 months.

6			4″			2‴	1	1	2	4′	6⁻
6‴	5′ Hyp.	4″	3′	2	1			1‴	2‴		6‴

This is a specimen case taken from our series, and illustrates the system of notation used. ′ = tooth just erupted; ″ = less than half of crown erupted; ‴ = rather more than half of crown erupted; ⁻ = almost fully erupted; whilst the absence of marks indicates complete eruption; Hyp. = hypoplastic.



We found little difficulty in determining the class into which the teeth should be placed except with regard to complete eruption. At first it was not intended to use the ⁻ sign, but we were compelled to adopt some method of indicating that the teeth were not fully through, and so were led to make some observation on the process of eruption.

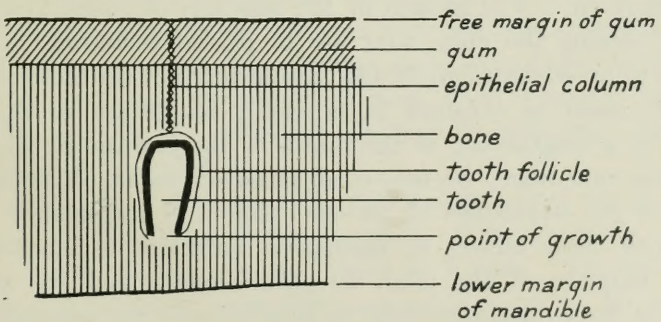
A completely erupted tooth presents the following characteristics: The crown of the tooth projects so that all the enamel is exposed except that portion covered by the free margin of the muco-periosteum (gum). The root of the tooth is firmly planted in the alveolus, which should be on a level with the neck of the tooth. The periodontal membrane is completely developed. The gum is firmly bound down to the bone, presenting a thin even margin in close contact with the tooth immediately beyond its continuation with the periodontal membrane.

The changes occurring during the period between the earliest state, when the tooth is buried deeply in the tissues and that of complete eruption, need to be considered. Much discussion has taken place concerning the nature of these changes. It would appear to us that there are two distinct factors bringing about this alteration :—

(1) A process of advancement of the tooth in the tissues; this is generally recognized.

(2) A process of denudation by absorption of the tissues overlying and surrounding the tooth.

With regard to the first factor, we are of the opinion that the point of eruption is determined by the presence of the epithelial columns connecting the oral epithelium with that lining the tooth-follicle. The advancement of the tooth is partly due to unequal rates of growth between the various tissues surrounding the tooth. We think it probable that the elongation of the root plays some part in advancing the tooth as represented in the following diagram :—



This is supposed to represent a lower incisor; we know growth occurs at the point marked with an arrow. As the crown is calcified it must either advance or the tissues below must be replaced. It is impossible to imagine, when we consider the length of the root, that concomitant growth of the jaw takes place to the same extent; and if X-rays of the jaw—e.g., those of Symington and Rankin—be examined, it will be seen that the base of the tooth where the root is going to be formed is so situated that it cannot be elongated in a downward direction. Another factor in the different rates of growth will appear to be the activity of the immediately supporting tissue which may be regarded as carrying the tooth to its final position, a view supported by other observers.

So far we have considered the unequal growth of tissue in a vertical plane only, but concurrently with this unequal growth also occurs in a horizontal plane. Sections made by one of us show that the epithelial column connecting the oral epithelium with the follicle undergoes degeneration centrally, and proliferation of the deeper cells of the oral epithelium takes place; with this change an unfolding occurs in the upper part, thus exposing a lower portion which in its turn undergoes a similar change. This reduces the depth of the tissue overlying the tooth which is therefore passive so far as the change is concerned. The process may be compared to the opening of a book, the hinged portion being advanced *pari passu* with the separation of the pages of the volume until it comes to occupy the same level as the free edges.

The second point that we wish to make is the process of denudation as a factor in exposing the tooth. This factor plays an important part in the final eruption of all teeth, coming into play earlier in some cases than others. The tooth which best illustrates the process is perhaps the first mandibular molar. If the first molars be examined in their earliest stage of eruption, it will be seen in the majority of cases, that although only just piercing the gum, they are in partial occlusion. There still remain ways by which room for the advancement of the tooth is possible. This space could be obtained by a closer adaptation of the occlusal surfaces; by a lengthening of the ramus of the jaw and by an advancement of the mandible; we believe all these do occur. The last factor, though not yet established is, in our opinion, of importance. Yet we do not think these factors of themselves sufficient to account for the complete eruption of the teeth by advancement, and we are of the opinion that the explanation must be sought for in the denudation of the

tooth by absorption of the tissues overlying it, a change we regard as being mainly due to the functional stimulus of mastication.

It is probable that everyone will agree that a tooth which has already perforated the gum is further exposed by the absorption of the tags of gum overlying it. We would like to point out that if this process be continued until the loose flaps of gum are removed down to the neck of the tooth, leaving the gum closely attached to the periodontal membrane with its free margin protected by the bulge of the tooth above it, the state of complete eruption is reached. The difficulty of determining the conclusion of this latter stage is considerable owing to the long period of time occupied even in healthy mouths. In unhealthy mouths, as in the case of the incisors in mouth-breathers and other conditions of impaired function, the change is much prolonged. Some cases, indeed, would appear to remain in a state of incomplete eruption almost indefinitely; this is particularly so where a condition of so-called pyorrhœa becomes established, as this affection is undoubtedly liable to occur in mouths where the absorption is incomplete.

In collecting data for this paper we came to the conclusion that it was almost impossible to draw a distinction between our last two groups—namely, the ¯ and the fully erupted. Our figures represent the teeth just erupting and the total number of teeth present in the mouth; all teeth which had less than half the crown exposed being regarded as just erupting.

Before continuing with the results of our investigations it may be of interest to record our method of procedure in procuring the data. In addition to recording the stages of eruption as already described we also noted the following particulars: Carious teeth present and conditions of hypoplasia; conditions of inflammation and suppuration; glandular enlargements which were so constantly present that they were afterwards omitted; mode of feeding in infancy; state of the child's general health as recorded by the physician or surgeon. It may be stated here that the great majority of the children were sent from other departments of the hospital, in many cases whether there were dental lesions present or not. Any special abnormalities were also recorded, but cases of cleft palate and similar conditions leading to abnormal dentition are not included in our tables.

The first stage in tabulating the data was to group the cases together in periods of three months ranging from 5 to 12 years, a separate list being made of teeth erupting prior to 5 years. The teeth present, and those just erupting, were then separately recorded for each group

of three months. The number of cases in each group, and the number of teeth present, and of teeth just erupting in that group, were determined; and in order to arrive at the percentages of a particular tooth, the number present on each side of the jaw (maxilla or mandible) were added together and halved. In order to make this more clear in, for instance, the case of the first mandibular molar:—

If a = the number of cases.
If x = the number of first mandibular molars of the right side.
If y = the number of first mandibular molars of the left side.

$$\text{Percentage} = \frac{x + y}{2} \times \frac{100}{a}$$

The following tables have been compiled in this manner, and from them a series of curves have been determined:—

PERCENTAGE TABLE OF $\overline{6 \mid 6}$ (TOGETHER).

Age of child						Total number of teeth present	Number of teeth just erupting
	Years	Months		Years	Months	Per cent.	Per cent.
From	5	0	to	5	3	19·7	9·3
,,	5	3	,,	5	6	26·4	10·3
,,	5	6	,,	5	9	29·1	18·3
,,	5	9	,,	6	0	57·7	26·4
,,	6	0	,,	6	3	63·2	27·5
,,	6	3	,,	6	6	80·9	30·5
,,	6	6	,,	6	9	77·1	30·5
,,	6	9	,,	7	0	89·0	17·6
,,	7	0	,,	7	3	93·0	20·8
,,	7	3	,,	7	6	96·8	13·7
,,	7	6	,,	7	9	95·2	9·0
,,	7	9	,,	8	0	98·2	4·0
,,	8	0	,,	8	3	100	3·5
,,	8	3	,,	8	6	97·0	2·8
,,	8	6	,,	8	9	100	—

PERCENTAGE TABLE OF $\underline{6 \mid 6}$ (TOGETHER).

From	5	0	to	5	3	9·8	5·3
,,	5	3	,,	5	6	14·4	10·5
,,	5	6	,,	5	9	29·1	17·5
,,	5	9	,,	6	0	49·4	20·4
,,	6	0	,,	6	3	50·4	24·0
,,	6	3	,,	6	6	67·8	28·1
,,	6	6	,,	6	9	65·2	22·0
,,	6	9	,,	7	0	82·0	17·1
,,	7	0	,,	7	3	86·9	24·3
,,	7	3	,,	7	6	92·0	14·8
,,	7	6	,,	7	9	90·4	11·4
,,	7	9	,,	8	0	98 5	4·5
,,	8	0	,,	8	3	96·4	4·7
,,	8	3	,,	8	6	97·1	2·1
,,	8	6	,,	8	9	100	under 1·0

PERCENTAGE TABLE OF 1 | 1 (TOGETHER).

Age of child						Total number of teeth present	Number of teeth just erupting
Years	Months		Years	Months		Per cent.	Per cent.
From 5	0	to	5	3		6·9	5·0
,, 5	3	,,	5	6		12·3	8·8
,, 5	6	,,	5	9		13·3	7·5
,, 5	9	,,	6	0		35·4	20·4
,, 6	0	,,	6	3		39·2	14·4
,, 6	3	,,	6	6		66·2	28·1
,, 6	6	,,	6	9		60·1	23·4
,, 6	9	,,	7	0		79·7	21·1
,, 7	0	,,	7	3		84·3	20·0
,, 7	3	,,	7	6		94·7	21·1
,, 7	6	,,	7	9		90·4	13·3
,, 7	9	,,	8	0		94·6	5·6
,, 8	0	,,	8	3		96·4	4·7
,, 8	3	,,	8	6		96·3	1·4
,, 8	6	,,	8	9		100	1·0

PERCENTAGE TABLE OF 1 | $\underline{1}$ (TOGETHER).

From 5	0	to	5	3	—		—
,, 5	3	,,	5	6	1·3		—
,, 5	6	,,	5	9	1·7		—
,, 5	9	,,	6	0	8·5		4·4
,, 6	0	,,	6	3	8·0		5·6
,, 6	3	,,	6	6	18·6		11·9
,, 6	6	,,	6	9	22·0		14·4
,, 6	9	,,	7	0	37·5		15·4
,, 7	0	,,	7	3	46·0		19·1
,, 7	3	,,	7	6	56·0		20 6
,, 7	6	,,	7	9	68·5		21·9
,, 7	9	,,	8	0	80·3		11·3
,, 8	0	,,	8	3	85·8		20·0
,, 8	3	,,	8	6	88·4		10·1
,, 8	6	,,	8	9	93·8		6·1
,, 8	9	,,	9	0	93·1		3·7
,, 9	0	,,	9	3	98·5		—
,, 9	3	,,	9	6	96·3		—
,, 9	6	,,	9	9	100		

PERCENTAGE TABLE OF 2 | 2 (TOGETHER).

From 5	9	to	6	0	3·4		2·0
,, 6	0	,,	6	3	5·6		4·0
,, 6	3	,,	6	6	11·4		10·7
,, 6	6	,,	6	9	13·5		6·7
,, 6	9	,,	7	0	29·2		16·2
,, 7	0	,,	7	3	28·6		16·5
,, 7	3	,,	7	6	49·2		28·5
,, 7	6	,,	7	9	66·6		24·7
,, 7	9	,,	8	0	72·4		17·8
,, 8	0	,,	8	3	71·8		21·1
,, 8	3	,,	8	6	84·0		10·8
,, 8	6	,,	8	9	94·8		14·4
,, 8	9	,,	9	0	94·1		6·1
,, 9	0	,,	9	3	96·7		4·8
,, 9	3	,,	9	6	97·2		5·4
,, 9	6	,,	9	9	96·8		1·5
,, 9	9	,,	10	0	98·4		2·8
,, 10	0	,,	10	3	100		1·8

PERCENTAGE TABLE OF $\frac{2}{2}$ (TOGETHER).

Age of child							Total number of teeth present Per cent.	Number of teeth just erupted Per cent.
	Years	Months		Years	Months			
From	6	9	to	7	0	... ...	5·4	3·0
,,	7	0	,,	7	3	... ...	4·3	3·4
,,	7	3	,,	7	6	... ...	10·5	8·4
,,	7	6	,,	7	9	... ...	20·9	9·5
,,	7	9	,,	8	0	... ...	31·5	18·1
,,	8	0	,,	8	3	... ...	36·4	21·1
,,	8	3	,,	8	6	... ...	48·5	21·7
,,	8	6	,,	8	9	... ...	63·9	27·8
,,	8	9	,,	9	0	... ...	70·8	20·5
,,	9	0	,,	9	3	... ...	79·0	35·4
,,	9	3	,,	9	6	... ...	81·8	24·5
,,	9	6	,,	9	9	... ...	82·8	10·9
,,	9	9	,,	10	0	... ...	90·0	11·5
,,	10	0	,,	10	3	... ...	100	11·3
,,	10	3	,,	10	6	... ...	95·0	7·5
,,	10	6	,,	10	9	... ...	92·3	7·6
,,	10	9	,,	11	0	... ...	96·1	5·1
,,	11	0	,,	11	3	... ...	97·3	7·9
,,	11	3	,,	11	6	... ...	96·0	1·9
,,	11	6	,,	11	9	... ...	97·4	—
,,	11	9	,,	12	0	... ...	100	—

PERCENTAGE TABLE OF $\frac{\overline{3}}{\overline{3}}$ (TOGETHER).

From	7	6	to	7	9	... ...	3·8	1·9
,,	7	9	,,	8	0	... ...	2·8	1·7
,,	8	0	,,	8	3	... ...	5·2	3·4
,,	8	3	,,	8	6	... ...	5·0	2·8
,,	8	6	,,	8	9	... ...	6·1	4·1
,,	8	9	,,	9	0	... ...	14·7	4·7
,,	9	0	,,	9	3	... ..	17·7	16·1
,,	9	3	,,	9	6	... ...	19·0	13·6
,,	9	6	,,	9	9	... ...	28·1	14·0
,,	9	9	,,	10	0	... ...	45·4	19·8
,,	10	0	,,	10	3	... ...	39·6	20·7
,,	10	3	,,	10	6	... ...	61·2	25·0
,,	10	6	,,	10	9	... ...	55·7	17·3
,,	10	9	,,	11	0	... ...	67·1	16·1
,,	11	0	,,	11	3	... ...	75·0	13·1
,,	11	3	,,	11	6	... ...	77·4	14·7
,,	11	6	,,	11	9	... ...	87·1	20·5
,,	11	9	,,	12	0	... ...	74·0	9·2

PERCENTAGE TABLE OF $\frac{3}{3}$ (TOGETHER).

From	8	3	to	8	6	... under	1·0	—
,,	8	6	,,	8	9	... ...	1·0	—
,,	8	9	,,	9	0	... ...	4·1	3·8
,,	9	0	,,	9	3	... ...	1·6	1·6
,,	9	3	,,	9	6	... ...	3·6	3·6
,,	9	6	,,	9	9	... ...	7·8	4·6
,,	9	9	,,	10	0	... ...	15·2	7·8
,,	10	0	,,	10	3	... ...	9·4	5·6
,,	10	3	,,	10	6	... ...	22·5	10·0
,,	10	6	,,	10	9	... ...	23·0	13·4
,,	10	9	,,	11	0	... ...	32·3	11·6
,,	11	0	,,	11	3	... ...	35·5	17·1
,,	11	3	,,	11	6	... ...	47·8	15·6
,,	11	6	,,	11	9	... ...	51·3	17·9
,,	11	9	,,	12	0	... ...	57·4	16·6

PERCENTAGE TABLE OF 4 | 4 (TOGETHER).

Age of child						Total number of teeth present Per cent.	Number of teeth just erupted Per cent.
	Years	Months		Years	Months		
From	6	9	to	7	0	0·7	—
,,	7	0	,,	7	3	—	—
,,	7	3	,,	7	6	2·1	2·1
,,	7	6	,,	7	9	4·7	4·7
,,	7	9	,,	8	0	6·3	4·5
,,	8	0	,,	8	3	8·1	8·1
,,	8	3	,,	8	6	10·8	5·0
,,	8	6	,,	8	9	10·3	3·0
,,	8	9	,,	9	0	18·1	8·1
,,	9	0	,,	9	3	20·9	17·7
,,	9	3	,,	9	6	28·1	13·6
,,	9	6	,,	9	9	29·6	20·3
,,	9	9	,,	10	0	42·5	15·2
,,	10	0	,,	10	3	33·3	7·4
,,	10	3	,,	10	6	50·0	16·2
,,	10	6	,,	10	9	44·2	11·5
,,	10	9	,,	11	0	60·0	12·9
,,	11	0	,,	11	3	63·1	6·5
,,	11	3	,,	11	6	65·6	13·7
,,	11	6	,,	11	9	79·4	5·1
,,	11	9	,,	12	0	77·7	9·2

PERCENTAGE TABLE OF 4 | 4 (TOGETHER).

From	6	9	to	7	0	2·1	2·1
,,	7	0	,,	7	3	6·0	5·1
,,	7	3	,,	7	6	5·2	4·7
,,	7	6	,,	7	9	11·4	8·5
,,	7	9	,,	8	0	11·6	8·2
,,	8	0	,,	8	3	9·4	8·2
,,	8	3	,,	8	6	22·4	15·9
,,	8	6	,,	8	9	28·8	18·5
,,	8	9	,,	9	0	38·0	15·7
,,	9	0	,,	9	3	41·9	29·0
,,	9	3	,,	9	6	40·9	21·8
,,	9	6	,,	9	9	46·8	25·0
,,	9	9	,,	10	0	57·8	19·4
,,	10	0	,,	10	3	58·4	26·4
,,	10	3	,,	10	6	73·7	17·5
,,	10	6	,,	10	9	69·2	17·3
,,	10	9	,,	11	0	78·0	12·2
,,	11	0	,,	11	3	80·2	17·1
,,	11	3	,,	11	6	86·2	21·5
,,	11	6	,,	11	9	84·6	7·6
,,	11	9	,,	12	0	88·8	11·1

PERCENTAGE TABLE OF 5 | 5 (TOGETHER).

From	7	6	to	7	9	1·9	1·9
,,	7	9	,,	8	0	2·2	1·7
,,	8	0	,,	8	3	2·2	—
,,	8	3	,,	8	6	5·0	2·1
,,	8	6	,,	8	9	4·1	3·0
,,	8	9	,,	9	0	8·8	3·4
,,	9	0	,,	9	3	6·4	1·6
,,	9	3	,,	9	6	10·0	5·4
,,	9	6	,,	9	9	18·7	9·3
,,	9	9	,,	10	0	21·9	9·0
,,	10	0	,,	10	3	24·5	9·4
,,	10	3	,,	10	6	26·2	12·5
,,	10	6	,,	10	9	38·4	9·6
,,	10	9	,,	11	0	34·7	9·0
,,	11	0	,,	11	3	38·1	10·5
,,	11	3	,,	11	6	44·1	6·8
,,	11	6	,,	11	9	48·7	5·1
,,	11	9	,,	12	0	61·1	5·5

PERCENTAGE TABLE OF $\underline{5 \mid 5}$ (TOGETHER).

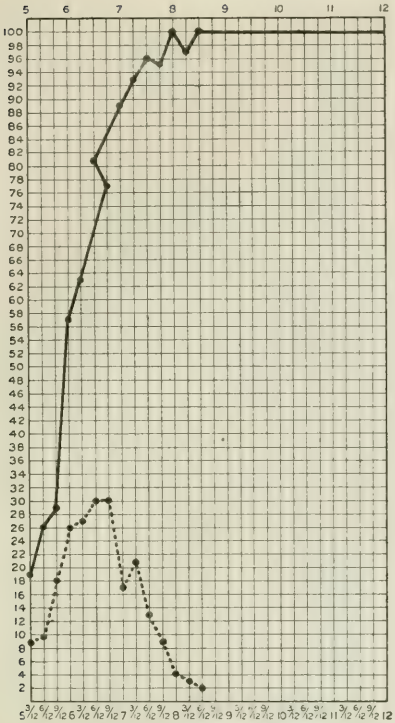
Age of child							Total number of teeth present	Number of teeth just erupted
	Years	Months		Years	Months		Per cent.	Per cent.
From	7	3	to	7	6		1·0	1·0
,,	7	6	,,	7	9		2·8	1·9
,,	7	9	,,	8	0		3·9	3·4
,,	8	0	,,	8	3		2·3	2·3
,,	8	3	,,	8	6		7·1	6·5
,,	8	6	,,	8	9		10·3	6·5
,,	8	9	,,	9	0		17·8	7·1
,,	9	0	,,	9	3		19·3	15·3
,,	9	3	,,	9	6		18·1	11·8
,,	9	6	,,	9	9		25·0	12·5
,,	9	9	,,	10	0		32·6	9·9
,,	10	0	,,	10	3		41·5	16·9
,,	10	3	,,	10	6		47·5	12·5
,,	10	6	,,	10	9		38·4	9·5
,,	10	9	,,	11	0		52·9	9·6
,,	11	0	,,	11	3		59·2	13·1
,,	11	3	,,	11	6		67·6	10·7
,,	11	6	,,	11	9		64·1	12·8
,,	11	9	,,	12	0		74·0	3·7

PERCENTAGE TABLE OF $\overline{7 \mid 7}$ (TOGETHER).

From	9	6	to	9	9	4·6	4·6
,,	9	9	,,	10	0	9·4	4·9
,,	10	0	,,	10	3	11·3	7·5
,,	10	3	,,	10	6	12·5	11·2
,,	10	6	,,	10	9	11·1	3·8
,,	10	9	,,	11	0	28·3	11·6
,,	11	0	,,	11	3	32·8	15·7
,,	11	3	,,	11	6	40·1	19·6
,,	11	6	,,	11	9	48·7	30·5
,,	11	9	,,	12	0	57·4	12·9

PERCENTAGE TABLE OF $7 \mid \underline{7}$ (TOGETHER).

From	9	9	to	10	0	4·1	1·6
,,	10	0	,,	10	3	3·7	—
,,	10	3	,,	10	6	1·0	1·2
,,	10	6	,,	10	9	5·7	—
,,	10	9	,,	11	0	16·7	8·3
,,	11	0	,,	11	3	15·7	7·8
,,	11	3	,,	11	6	24·5	9·8
,,	11	6	,,	11	9	35·8	17·9
,,	11	9	,,	12	0	44·4	9·2

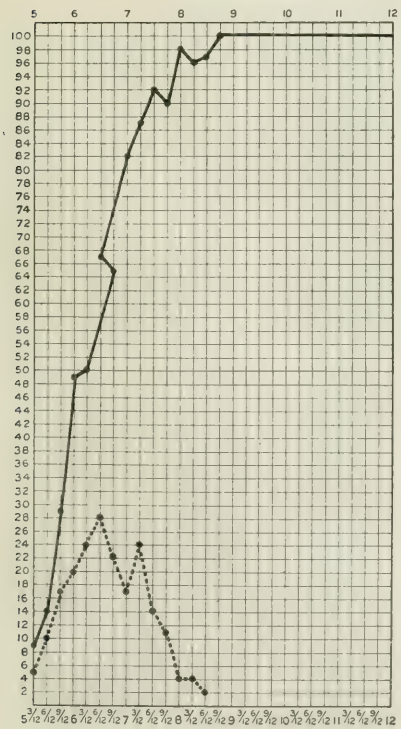


Lower First Molars ($\overline{6|6}$) not included in Chart.

Age	
4 yrs.	two $\overline{6}$ | / one | $\overline{6}$
4 yrs. 1 mon.	one $\overline{6}$ |
4 yrs. 4 mos.	one 6 $\overline{\|}$ / one | $\overline{6}$
4 yrs. 6 mos.	two $\overline{6}$ | / two | $\overline{6}$
4 yrs. 8 mos.	one | 6
4 yrs. 9 mos.	one $\overline{6}$ | / one | $\overline{6}$
4 yrs. 10 mos.	two $\overline{6}$ | / two | $\overline{6}$
4 yrs. 11 mos.	two $\overline{6}$ | / one | $\overline{6}$

$\overline{6|6}$ together.

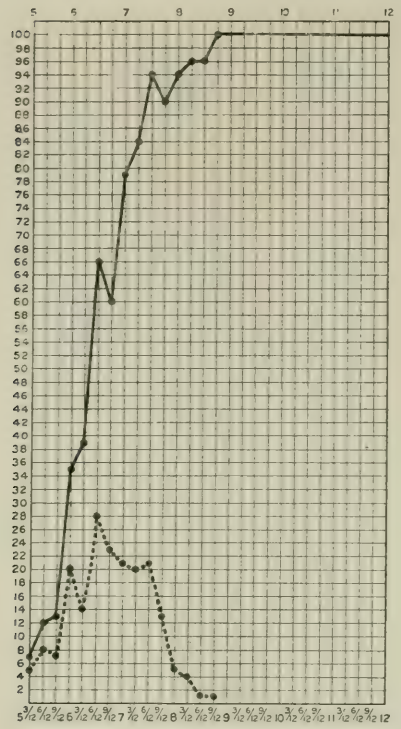
—— = teeth present. . . . . = teeth just erupting.



Upper First Molars ($6|\underline{6}$) not included in Chart.

Age	
4 yrs.	one 6 | / one | $\underline{6}$
4 yrs. 6 mos.	two 6 |

$6|\underline{6}$ together.



Lower Central Incisors ($\overline{1}\,|\,1$) not included in Chart.

Age

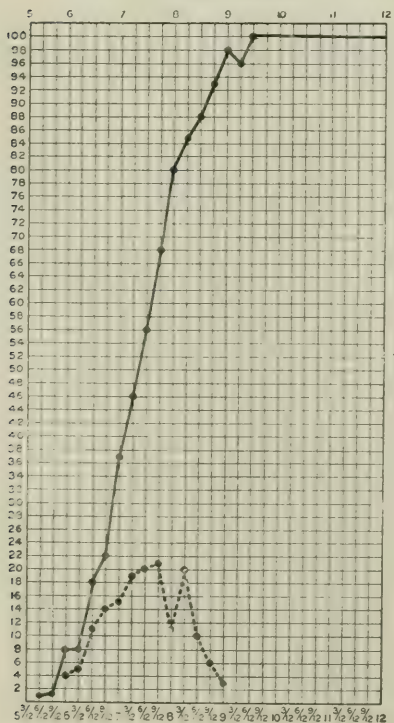
4 yrs. 6 mos. one $\overline{1}\,|$

4 yrs. 9 mos. one $\overline{1}\,|$

4 yrs. 10 mos. one $\overline{1}\,|$, one $|\,1$

$\overline{1}\,|\,1$ together.

—— = teeth present. . . . . = teeth just erupting.

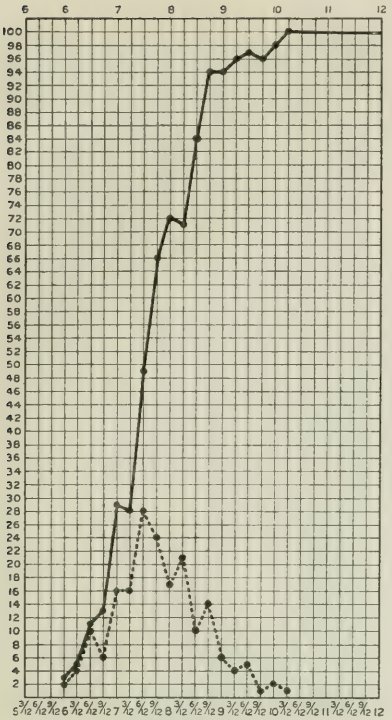


Upper Central Incisors ($1\,|\,\overline{1}$) not included in Chart.

Age.

5 yrs. to 5 yrs. 3 mos. one $|\,1$

$1\,|\,\overline{1}$ together.

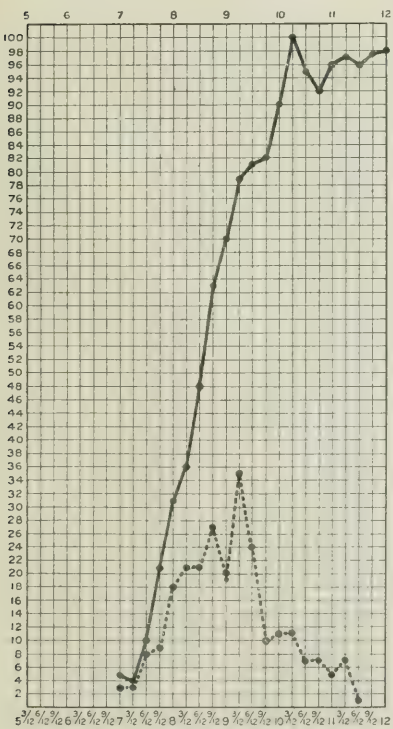


Lower Lateral Incisors ($\overline{2}\,|\,\overline{2}$) not included in Chart.

Age	
5 yrs. to 5 yrs. 3 mos.	one $\overline{2}$ |
5 yrs. 3 mos. to 5 yrs. 6 mos.	one $\overline{2}$ | two | $\overline{2}$
5 yrs. 6 mos. to 5 yrs. 9 mos.	two $\overline{2}$ | two | $\overline{2}$

$\overline{2}\,|\,\overline{2}$ together.

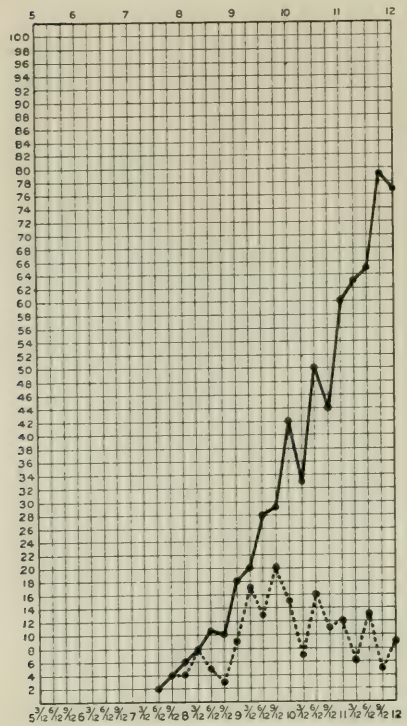
—·— = teeth present. . . . . = teeth just erupting.



Upper Lateral Incisors ($\underline{2}\,|\,\underline{2}$) not included in Chart.

Age	
5 yrs. to 5 yrs. 3 mos.	one | $\underline{2}$
5 yrs. 9 mos. to 6 yrs.	two | $\underline{2}$
6 yrs. to 6 yrs. 3 mos.	one $\underline{2}$ | two | $\underline{2}$
6 yrs. 3 mos. to 6 yrs. 6 mos.	one $\underline{2}$ | one | $\underline{2}$
6 yrs. 6 mos. to 6 yrs. 9 mos.	two $\underline{2}$ | one | $\underline{2}$

$\underline{2}\,|\,\underline{2}$ together.



Lower premolars ($\overline{4 \mid 4}$) not included in Chart (15 teeth).

Age

5 yrs. 6 mos. to 5 yrs. 9 mos. $\overline{4 \mid}$ Necrosed! No history of $\overline{d \mid}$

5 yrs. 9 mos. to 6 yrs. { two $\overline{4 \mid}$ / two $\overline{\mid 4}$

6 yrs. 3 mos. to 6 yrs. 6 mos. $\overline{4 \mid}$ Hypoplastic

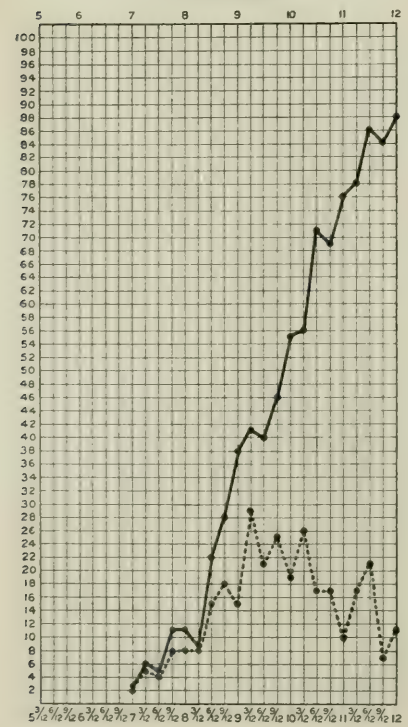
6 yrs. 6 mos. to 6 yrs. 9 mos. $\overline{\mid 4}$ Hypoplastic

6 yrs. 9 mos. to 7 yrs. { three $\overline{4 \mid}$ / four $\overline{\mid 4}$

7 yrs. to 7 yrs. 3 mos. $\overline{\mid 4}$

$\overline{4 \mid 4}$ together.

—— = teeth present. . . . . = teeth just erupting.



Upper First Premolars ($\underline{4 \mid 4}$) not included in Chart.

Age.

5 yrs. to 5 yrs. 3 mos. one $\underline{4 \mid}$ (D)

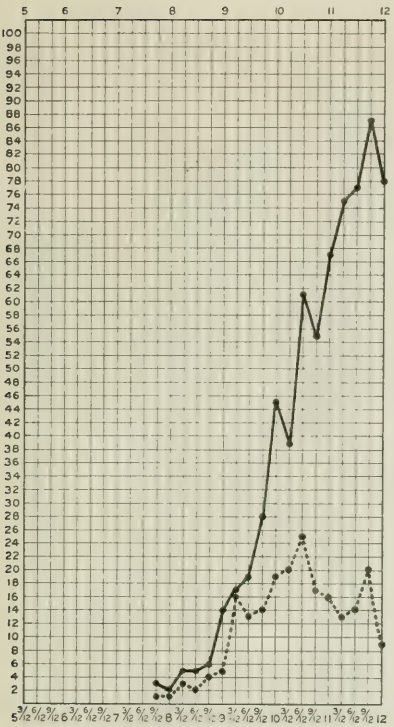
5 yrs. 3 mos. to 5 yrs. 6 mos. one $\underline{\mid 4}$

5 yrs. 9 mos. to 6 yrs. { one $\underline{4 \mid}$ / two $\underline{\mid 4}$

6 yrs. to 6 yrs. 3 mos. { two $\underline{\mid 4}$ / Hypoplastic (one) / one $\underline{4 \mid}$

6 yrs. 6 mos. to 6 yrs. 9 mos. { one $\underline{4 \mid}$ / one $\underline{\mid 4}$

$\underline{4 \mid 4}$ together.



Lower Canines ($\overline{3}\,|\,\overline{3}$) not included in Chart.

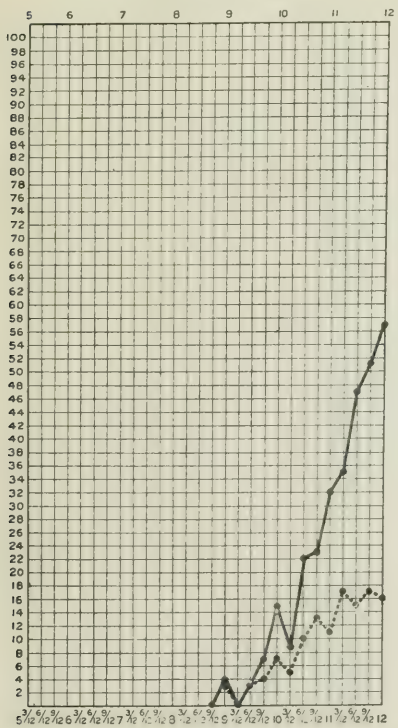
Age

6 yrs. 9 mos. to 7 yrs. { one $\overline{3}$ | one | $\overline{3}$

7 yrs. 3 mos. to 7 yrs. 6 mos. { one $\overline{3}$ one | $\overline{3}$

$\overline{3}\,|\,\overline{3}$ together.

—— = teeth present. . . . . = teeth just erupting.

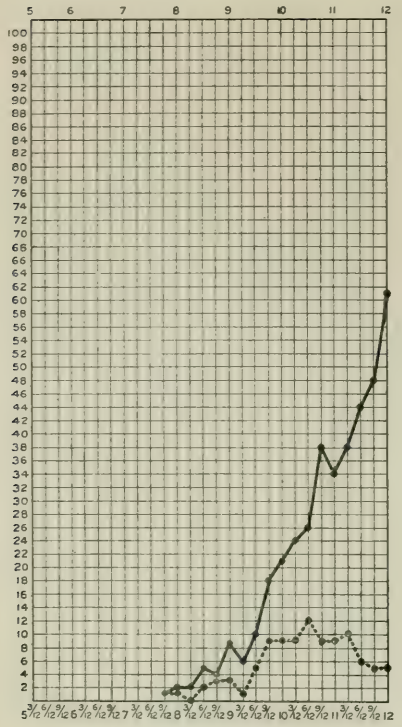


Upper Canines ($\underline{3}\,|\,\underline{3}$) not included in Chart

Age.

8 yrs. 3 mos. to 8 yrs. 6 mos. { two $\underline{3}$ | one | $\underline{3}$

$\underline{3}\,|\,\underline{3}$ together.



Lower Second Premolars ($\overline{5|5}$) not included in Chart.

Age

5 yrs. 3 mos. to 5 yrs. 6 mos. — one $|\,5$ Hypoplastic

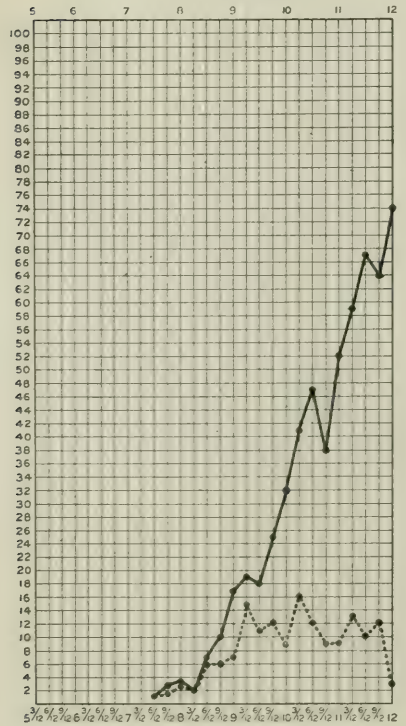
5 yrs. 9 mos. to 6 yrs. — one $\overline{|\,5}$

6 yrs. 9 mos. to 7 yrs. — six $\overline{5\,|}$ Hypoplastic (3); three $\overline{|\,5}$

7 yrs. 3 mos. to 7 yrs. 6 mos. — two $\overline{5\,|}$; one $\overline{|\,5}$ Hypoplastic

$\overline{5|5}$ together.

—— = teeth present. . . . . = teeth just erupting.



Upper Second Premolars ($\underline{5|5}$) not included in Chart.

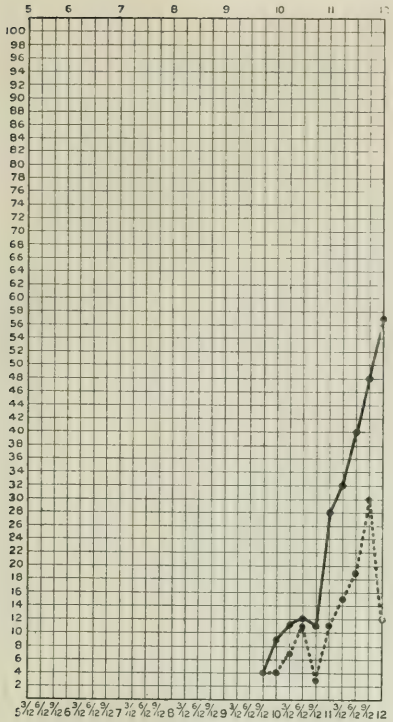
Age

6 yrs. to 6 yrs. 3 mos. — one $\underline{5\,|}$; one $\underline{|\,5}$

6 yrs. 3 mos. to 6 yrs. 6 mos. — one $\underline{5\,|}$

6 yrs. 7 mos. to 7 yrs. — one $\underline{5\,|}$; one $\underline{|\,5}$

$\underline{5|5}$

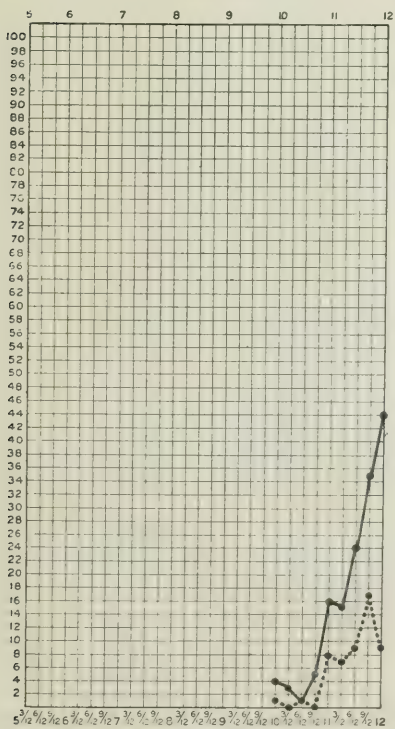


Lower Second Molars (7 | 7) not included in Chart.

Age	
8 yrs. 9 mos. to 9 yrs.	three 7 | / three | 7
9 yrs. to 9 yrs. 3 mos.	two $\overline{7}$ | / one | $\overline{7}$
9 yrs. 3 mos. to 9 yrs. 6 mos.	two $\overline{7}$ | / two | $\overline{7}$

$\overline{7}$ | $\overline{7}$ together.

—— = teeth present. . . . . = teeth just erupting.



Upper Second Molars (7 | 7) not included in Chart.

Age	
9 yrs. 6 mos. to 9 yrs. 7 mos.	one 7 | 7

7 | 7 together.

It is almost unnecessary to comment on the charts, as they speak for themselves. The earliest cases of eruption occurred at the age of 4; in one $6'''$ | was present, in the other $\frac{6'''}{6'''}$ | $\frac{6'''}{6'''}$. The latter case is of interest, as at 4 years 6 months | $\overline{1'}$ appeared, and at 5 years 1 month $\frac{1'''}{1'''}$ | $\frac{1'''}{1'''}$ were present. Sixteen cases of eruption of the first molars before the age of 5 were observed; in only one case were all four molars present; of the others, in only one was a maxillary molar present. Two of these cases are of considerable interest, as the children were attending the hospital for severe rickets. In one case $\frac{6'}{1'}$, in the other $6''$ | were present.

This proportion of two cases with rickets out of sixteen cases of eruption before the age of 5 is significant, and we would like to state that, although the view has come to be generally accepted that "rickets retards" eruption, while true of the temporary dentition, is not borne out by our experience of the permanent series. We would admit that it causes variation.

The cases of early eruption, which are not included in the charts, have been placed by the side of the chart of each respective group. Comment is therefore unnecessary.

In considering the various teeth, the following points are of interest:—

6 | 6.—The curve of the teeth present shows a marked ascent from 5 years 3 months to 7 years 6 months. The maximum of teeth just erupting being at 6 years 6 months (30 per cent.).

6 | 6.—The curve of teeth present shows a marked ascent from 5 years 3 months to 7 years 6 months. The maximum of teeth just erupting being at 6 years 6 months (28 per cent.).

Although these statements make the mandibular and maxillary molars appear almost the same, if the curves be examined double the number of the former are present at 5 years 3 months, and 100 per cent. is reached practically nine months sooner.

1 | 1.—The curve of teeth present ascends markedly from 5 years 9 months to 7 years 6 months. The maximum of teeth just erupting is reached at 6 years 6 months (28 per cent.).

1 | 1.—The curve of teeth present ascends markedly from 6 years 3 months to 9 years. The maximum of teeth just erupting is reached at 7 years 9 months (21 per cent.).

The mandibular teeth again precede those of the maxilla.

$\frac{2}{2}$ | $\frac{2}{2}$.—The curve of teeth present ascends markedly from 6 years to 8 years 9 months. The maximum of teeth just erupting is reached at 7 years 6 months (28 per cent.).

$\frac{2}{2}$ | $\frac{2}{2}$.—The curve of teeth present ascends markedly from 7 years 3 months to 10 years. The maximum of teeth just erupting is reached at 9 years 3 months (35 per cent.).

The difference between the mandibular and maxillary teeth is here very considerable.

$\frac{4}{4}$ | $\frac{4}{4}$.—The curve of teeth present ascends markedly, but with considerable irregularity, from 8 years 9 months to 11 years 9 months. The maximum of teeth just erupting is at 9 years 9 months (20 per cent.).

$\frac{4}{4}$ | $\frac{4}{4}$.—The curve of teeth present ascends markedly, also with considerable irregularity, from 8 years 3 months to 11 years 6 months. The maximum of teeth just erupting is at 9 years 3 months (29 per cent.).

The maxillary teeth precede those of the mandible by about six months. The great irregularity of the curves is of interest and covers a long period. Our charts are imperfect for these teeth, as both curves in each case continue beyond the age of 12; prior to this age in neither case are 90 per cent. of the teeth present.

$\frac{5}{5}$ | $\frac{5}{5}$.—The curve of the teeth present ascends markedly from 9 years 3 months to 12 years, when only 61 per cent. of the teeth are present. The maximum of teeth just erupting is at 10 years 6 months (12 per cent.); the curve forms a plateau from 9 years 9 months to 11 years 3 months.

$\frac{5}{5}$ | $\frac{5}{5}$.—The curve of the teeth present ascends markedly from 8 years 3 months to 12 years, when only 74 per cent. of the teeth are present. The maximum of teeth just erupting is at 10 years 3 months (16 per cent.).

The maxillary teeth precede those of the mandible by about six months. It is of note that the curve of the second premolars is more symmetrical than that of the first in both teeth present and those just erupting.

$\frac{3}{3}$ | $\frac{3}{3}$.—The curve of teeth present ascends markedly from 8 years 9 months to 11 years 9 months, when 87 per cent. were present. The maximum period of teeth just erupting is 10 years 6 months (25 per cent.).

$\frac{3}{3}$ | $\frac{3}{3}$.—The curve of teeth present ascends markedly from 9 years 3 months to 12 years, when 57 per cent. were present. The maximum period of teeth just erupting occurs at 11 years 3 months and 11 years 9 months (17 per cent.).

The mandibular precede the maxillary by about a year. In both cases more than 50 per cent. of the teeth are present, and therefore the maximum points of teeth just erupting has probably been reached, although the curve is incomplete.

7 | 7.—The curve of teeth present ascends markedly from 10 years 9 months to 12 years (57 per cent.). The maximum period of teeth just erupting is 11 years 9 months (30 per cent.).

$\underline{7 \mid 7}$.—The curve of teeth present ascends markedly from 10 years 6 months to 12 years (44 per cent.). The maximum period of teeth just erupting is 11 years 9 months (17 per cent.).

The mandibular teeth commence eruption a little earlier, but on examination of the curves would appear to be about three months early. These curves are, of course, imperfect.

The following table has been compiled from the charts and may roughly be taken as the average date at which the teeth appear:—

Years	Months					
At 6	0	over 50 per cent. of the		6 | 6	were present	
,, 6	3	,,	,,	6 | 6	,,	
,, 6	6	,,	,,	1 | 1	,,	
,, 7	6	,,	,,	$\underline{1 \mid 1}$	,,	For $\underline{1 \mid 1}$ 100 per cent. is reached six months earlier than $\underline{2 \mid 2}$
,, 7	6	,,	,,	$\underline{2 \mid 2}$	,,	
,, 8	9	,,	,,	2 | 2	,,	
,, 10	0	,,	,,	4 | 4	,,	
,, 10	6	,,	,,	$\underline{4 \mid 4}$	,,	100 per cent. is not reached in either case
,, 10	6	,,	,,	$\underline{3 \mid 3}$	,,	
,, 11	0	,,	,,	5 | 5	,,	
,, 11	9	,,	,,	$\underline{3 \mid 3}$	,,	
,, 12	0	,,	,,	$\underline{5 \mid 5}$	,,	$\underline{5 \mid 5}$ commence earlier and show a larger proportion, although 100 per cent. not reached
,, 12	0	,,	,,	7 | 7	,,	
After 12	0	,,	,,	$\underline{7 \mid 7}$	,,	

(would probably be 12 years 6 months)

In conclusion, we realize that data based upon so comparatively small a number of cases as 4,850 is open to criticism, and also that the age limit of 12 years somewhat reduces the value of our observations; yet we believe our results have been obtained with sufficient care to render them of some use in determining rather more precisely the relative dates of eruption of the permanent teeth.

DISCUSSION.

The PRESIDENT (Mr. H. Lloyd Williams) said the paper was a very interesting one, and gave the result of years of work and very careful observation. Although the tables given by the authors supported the old formula that most students learned and that were given in the text-books generally, there were some variations which were quite surprising.

Mr. J. F. COLYER, after thanking the authors for their very excellent piece of work, said he did not intend to criticize the paper harshly, but with a view to asking them to work out a few more points in order that it might be possible to get nearer the truth. What he wished particularly to point out was that the authors' statistics were taken from sick children, which must go a long way towards invalidating the value of their results. He was perfectly certain that if the statistics were worked out for normal children, different results would be obtained from those shown. He had been very much interested in the question of glandular enlargements, to which the authors had referred. The question was simply a personal one, and it would be very interesting if by some means or other they could arrive at some idea of what a gland really was. It would be of interest if the authors would state whether in compiling their statistics they had made a note of whether there was an early extraction of teeth, because the early extraction of a deciduous molar would cause the early eruption of a permanent molar, and the early extraction of deciduous teeth expedited the eruption of premolars. Another point which might be worked out was the question of the difference of eruption in the various social states. Another point to consider was the variations of time of eruption between the different races; there was a difference between the Jews and the Gentiles, and he would like the authors to work out the time of eruption in the long-headed and the broad-headed people.

Mr. SIDNEY SPOKES desired to emphasize the great use the investigation of the authors would be. As births were now registered, the same question did not arise as arose in olden days when the age of children was not sufficiently well authenticated. Under the Childrens Employment Act of 1893 and the Criminal Law Amendment Act of 1895 it became very important indeed to know the ages of young children. At a meeting of the old Odontological Society in 1883, Mr. Smith Turner exhibited the jaw of the girl who was found murdered in the Goswell Road, and endeavoured to obtain the opinion of the members as to the age of the individual. Although registration was now carried out, some cases still arose when it was most important that all the information as to the condition of teeth, the state of the eruption, and so on, should be made known. Certain cases also arose where registration returns

were not available. For instance, the law presumed that a child not over the age of 7 was incapable of committing an indictable offence, and that was a very important medico-legal point. Also if a child was not over 14 it was not permissible to punish it unless direct malice could be shown. There were all manners of questions that were very interesting from that point of view on which the paper threw some light. The work the authors were doing was extremely valuable, quite apart from any of the anatomical points of interest that came home to the various members. Personally he had worked out certain figures which related to people in a different class of life from those dealt with by the authors. He took very careful notes of the eruption of the permanent teeth of over 1,100 boys in a big public school, the figures extending over several years. He had therefore followed with a great deal of interest the charts shown by the authors, and found that in some points they corroborated his own figures, for instance, with regard to the lower canines. The authors' work would, he thought, afford a very important basis upon which future investigations would be conducted.

Mr. J. G. TURNER said he desired to refer to the point that Mr. Colyer had already raised, namely, that the authors' figures dealt with sick children, and that he doubted whether the results would be anything like those obtained with healthy children. One was accustomed to immense variations in all teeth, but he was inclined to think from the impression he had gathered of healthy children that their eruption would prove to be later than shown by the authors. The change of the premolars and canines was often quite a late thing. It was just as if the children began to get old later than children under other conditions. As usual, they were up against sepsis. The temporary teeth were destroyed, and that entirely upset the eruption of the premolars. If a temporary molar went too soon on account of pulp pain without surrounding sepsis, the bone was not softened, and there was no early eruption, but on the contrary a tendency to a locking in of the premolars on account of the movements of the remaining teeth, and so a later eruption. On the other hand, if the teeth had been taken out for sepsis, the bone would soften, and the succeeding teeth would erupt early. These processes would occur very largely among those children. It was not a question of one or two out of ten; it was a question of nine out of ten or ten out of ten, who might be expected to have something wrong with the temporary teeth. Again, if the first permanent molar was taken out, the second permanent molar would be expedited, especially the lower second molar, because it was unlocked. The accident that needed the extraction was so common that he was afraid they were not dealing in 50 per cent. of the cases with children who might be called fairly normal. He would like to ask the authors whether they had a note of that factor in comparing the value of the statistics? It would be more valuable where the normal or the nearly normal individuals were compared with the normal. He congratulated the authors on the results of their sustained effort, which would always be there to help investigation.

Mr. W. W. JAMES, in reply, said there were several other tables that the authors could have compared their tables with, but they thought it better not to do so because they were on somewhat different lines. The chief importance of the charts was that they gave a range of periods; they did not fix one to any particular date. Mr. Colyer and Mr. Turner referred to the question that the statistics related to unhealthy children. As a matter of fact, the children that visited the Dental Department of the Hospital for Sick Children were all outpatients and really healthy, and if any abnormal cases were seen they were practically excluded; for instance, cases such as cleft palate, of which there were a large number. A number of the children had perfect dentitions, some of them without any caries in the mouth. A great many of them were sent on from the throat department, where some of the surgeons would not treat the patients until they had seen the dentist. It was true that there was a great deal of sepsis and that a number of temporary molars were constantly removed. With regard to its effect on the permanent series of premolars, it was interesting to note that the dates given in the tables were later than the ones usually given. How far it was affected by the sepsis he did not know. With regard to the question of the illnesses the children had, those points were noted in the books, and it was possible to work out to some extent the glandular enlargements. Very careful records were kept of all the glandular enlargements. It was possible to tell with one's eyes shut whether one had a patient with the carious teeth removed or not. In about half of the cases there was very little change, but where the glands were enlarged and definitely soft it was often possible to find them contracted down to hard nodules. Personally he preferred to examine them and feel how soft or hard they were so far as the condition of activity was concerned rather than their being in an elevated condition so that they could be seen. With regard to the question of the effect of early extraction, all the cases were practically new cases. The children were all told to come back in six months so that it was possible to examine the changes that had gone on in the mouth, but the tables referred to were made up from new cases entirely. He would leave the question of the difference between the long-headed and the broad-headed people to be worked out by Mr. Colyer. He was very interested to hear of the statistics to which Mr. Sidney Spokes had referred, and it would be very interesting if some tables could be prepared from them. Mr. Turner had referred to the septic months that were commonly met with in children. If one attempted to work out statistics from what might be called the dentally normal they were really working on the dentally abnormal, because he was not sure that the mouth with a perfect temporary dentition could be regarded as normal at the present time.

Demonstration on the Formation of Ions and their Application in the Treatment of Periodontal Membrane.

By Ernest Sturridge, L.D.S.

About fourteen years ago I began a number of experiments with the electric current to ascertain its action on drugs when applied to periodontal membrane. The phenomenon of cataphoresis as explained by Morton, of New York, and others was uppermost in my mind, the driving of drugs *en masse* into the tissues being the main object.

I met with a certain amount of success with this method, but I also had many failures. The successes I recorded were sufficient encouragement for me to continue on the lines I had started, but gradually I became convinced that the amount of current strength possible to be used on the tissues of the mouth was insufficient to perform cataphoresis in an effective manner. I began to think that it was probable that the good results I had obtained were derived from ions and not by cataphoresis, consequently I directed my attention solely to drugs from which ions are readily formed. I recorded their action on the tissues and in this way gradually obtained a comparative list of the action of ions obtained from certain metals and alkaloids which are produced at the positive electrode, and others, like iodine, which is produced at the negative electrode.

In order to appreciate the action of ions it is necessary to understand something about their formation. The theory of ions is not difficult to understand; of late years many experiments have been performed by eminent workers in electro-therapeutics which demonstrate conclusively the formation and migrations of ions. When an electric current is passed through a conducting body or electrolyte the conductivity depends on the amount and quality of good conductor atoms contained in it; for example, pure water is a poor conductor of current, but if water contains sodium chloride (NaCl) or zinc chloride (ZnCl) in solution the liquor becomes a good conductor, that is, the atoms NaCl and ZnCl readily receive the charges of electricity and conduct them. These atoms are the ions which remain in the water in no regular formation and with no particular destiny, but directly a current is passed through the electrolyte containing them a great change takes place; the atoms become charged

This book must be returned to the Dental Library by the last date stamped below. It may be renewed if there is no reservation for it.

JUN 11 '69

270-347-1 M

James, W. and Pitts, A. T. 489768
Some notes on the dates of eruption in 4,850 children.
DATE.
University of Toronto
Library
Dent
489768
DO NOT
REMOVE
THE
CARD
FROM
THIS
POCKET
Acme Library Card Pocket
LOWE-MARTIN CO. LIMITED